Document Title: Radiological Background Study Report, Santa Susana Field Laboratory, Ventura County, CA
Version: Draft-Final
Reviewers: Mr. Abe Weitzberg, The Boeing Company (Boeing) , Aerospace Contamination Museum of Education (ACME), Cleanuprocketdyne.org

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Mr. Abe Weitzberg					
AW	1	Overall I find the report to be very good, and you have addressed most of the concerns that I and others have expressed in our meetings on the subject. One important area that is not mentioned at all is that the documented study deliberately did not address possible redistribution and concentration of background radionuclides such as Cs-137, which may be significantly different at the on-site locations as opposed to the relatively flat background locations. Since natural redistribution of these radionuclides would not be as a result of site activities, they should not be remediated.	NA	NA	This issue will be addressed during the on-site investigation when decisions on step-out sample locations are made.
AW	2	Note that the AOC also stipulates that cleanup be to detection limits for those radionuclides for which there is no background. "Detection limits for specific contaminants exceed the local background concentration, in which case the cleanup goal shall be the detection limits for those specific contaminants." I suggest that you add the phrase referring to detection limits to the above paragraph to be rigorously correct. Note that this is independent of risk, which is contrary to NEPA.	Executive Summary	ES-2	EPA recognizes this exception to the clean-up of radioactive contaminants to local background concentrations in the AOC. As there are multiple exceptions discussed in the AOC, EPA does not believe it is necessary to add this specific exception to this document.
AW	3	Obvious typo in section 8.2.2.5	8.2.2.5	8-6	The typo of "radon-22" has been changed to "radon-222" in the final report.

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AW	4	Note that SB 990 has been declared unconstitutional and therefore the use of agricultural PRG no longer has a basis. Even if one were to assume an agricultural land use, I believe that site specific scenarios and pathways should be used rather than generic PRGs that may be inappropriate. I think this consideration should be added to your section 9 discussion of management decisions. Certainly the PRGs would be preferable to the BTVs for the low risk radionuclides, but realistic scenarios and pathways are the proper approach.	9.1	9-1	The selection of the agricultural PRG as the Clean-Up Value when it is greater than the BTV will be determined during the development of the Look-Up Table. DTSC will provide the process for public involvement in these decisions.
AW	5	At the technical meetings where the background study was presented and discussed, I expressed my concern with the practice of presenting background concentrations as real pCi/g when the specific nuclide is acknowledged not to be detected. It was stated that although the gamma counts attributed to the windows where the nuclide's gamma would be if they were present came from unknown sources (other nuclides, most likely NORM) use of these values as BTVs was OK if the methodology is consistently applied. It appears that the draft report concentrates only on the statistical side of the data analysis, and almost totally neglects the physical meaning and consistency of the data for those nuclides that are not detected. Even for those that are detected, there are apparent inconsistencies, as discussed in the Tom Rucker memo of June 20, 2011 "Comments on SSFL Radionuclide Background Data Sets and Their Statistical Treatment." Section 6.2.1 of the Draft Report looks at the general limitations of the data analysis and acknowledges some issues that are believed to be small and of little consequence. Nevertheless, I believe it	NA	NA	While Mr. Weitzberg's concern for the level of understanding of the lay-stakeholders is acknowledged, the biases to the data and the limitations in their use are believed to have been properly disclosed and adequately discussed in a manner that is easily understood by most stakeholders. It may be helpful to have a face-to-face Q&A session with the stakeholders in which these pertinent issues can be further explained, if necessary, and to ensure that there is no misunderstanding of the information being presented. Mr. Weitzberg's objections appear to extend to other indeterminate radionuclides for which a similar bias has not been shown, (which do not generally show "detected" results) but for which the impact of such a potential bias is feared to cause decision errors in the evaluation of on-site data. While these issues are somewhat more complicated than those discussed above, they have

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AW	5 (cont.)	would be most helpful to the community and those who would develop the look-up tables, if additional information was provided that separately identifies those nuclides that are detected in all samples and those which are only "detected" in a small number of samples and are not physically present in the background and have data qualifiers that may be confusing to most. I personally do not believe there is any physical difference in nuclides that have less than 4 detects and those that have 5, 6, 7 or even 12 or 40 detects. These are statistical distinctions and represent no physical reality. I suggest that the independent review suggested by Dr. Rucker be undertaken immediately, and that an additional section be added to the report that discusses in detail the inconsistencies, uncertainties and redundancies in the presented results, so as to aid in the development of the look-up tables. Simply to include all of the data without any further guidance, as EPA has done, is not helpful to the process.			been carefully considered. "Non-detected" radionuclides might be subject to either a positive or negative bias. In the presence of significant or measurable positive bias, the results would no longer be "non-detected". "Non-detected" radionuclides subject to a significant negative bias would show a measurable negative trend, likely in the samples and certainly in the method QC. Such results would inevitably fail the "negative activity" test performed on all results, and those results would be rejected. There is not believed to be significant adverse risk of otherwise undetected bias in the sample results. As to the statistical treatment of data sets with small numbers of "detects" vs. data sets with large numbers of "detects", that is a matter of considerable technical debate. The purpose of the SSFL Radiological Background Study is to determine BTVs as directed in the AOC. As discussed in the report, if a radionuclide has less than five detections, the maximum non-detect value was determined to be the BTV. If the radionuclide exhibited greater than 5 detections, the USL95 was used to statistically determine a BTV. Five detections were used as the cutoff because five detections were enough to conduct a defensible statistical analysis. During the development of the Look-Up Table, all the data from this study (i.e., maximum detected values, maximum non-detect vales) for each radionuclide will be available, so the stakeholders can make informed comments on the proposed Clean-Up Values.

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AW	6	Section 6.2.4 of the Draft Report looks at inter-method comparison of results and notes a number of biases, but instead of working to understand the source of the bias and its significance it defers the issue as some possible future work. The statement "Nonetheless, the magnitude of the apparent bias should be considered in the comparison of on-site results to the BTVs" defers the issue to some unknown future resolution and does not alert those who would promulgate the look-up tables to possible consequences of these biases. Note that these inter- method comparisons are for the good data where nuclides are actually detected. The implications of these kinds of uncertainties and biases for the non-detected nuclides remains a large possibly important unknown, particularly so because the cleanup is supposed to be to background or detection limits.	6.2.4	6-4	Mr. Weitzberg appears to be concerned about certain results that appear to be subject to a measurable bias of indeterminate cause, but for which the magnitude of the bias is not believed to be significant compared to the BTVs. The limitations in the use of the data are believed to be adequately disclosed. In these cases there may be orders of magnitude difference between the observed bias and the PRGs or BTVs. As a practical consideration, it does not appear that these issues will benefit from further, likely unfruitful, investigation into the root cause of the relatively inconsequential bias.
AW	7	Finally, to add to my concern I found some disturbing information regarding the software that may have been used to evaluate the raw gamma data. Previously, I had noted that the project documentation stated that a proprietary computer program was used to analyze the raw gamma spectra data, and I raised a question about the program documentation and its validation. I received no additional information, but when I was now examining the Appendices that accompanied the draft report I noted therein a reference to GammaVision, which is a gamma spectroscopy software product. I now assume it was used by Pace Laboratories. A quick search of the literature revealed a 2009 report that evaluated a number of similar software products and was less than complimentary about GammaVision. The report can be found at URL: http://pintassilgo2.ipen.br/biblioteca/2009/inac/15084.pdf	NA	NA	Mr. Weitzberg expresses concern regarding the use of the GammaVision (GV) software package, citing a paper presented at a technical conference (INAC) in 2009 by Zahn, *et al.* While Mr. Weitzberg's comments are appreciated and have been carefully considered, they are not believed to be applicable to the current project data for a number of reasons. The paper that Mr. Weitzberg refers to is significantly flawed in both its experimental approach and in its presentation of the results. The version of GV used in the study (5.10) is not believed to be consistent with the version used in the SSFL background study (6.n). This is considered a minor discrepancy; however of much more significant concern is the paper's lack of rigor in specifying comparable analytical parameters prior to the study or disclosing which analytical parameters were actually used in the

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AW	7 (cont.)	Some key findings from the abstract and the conclusions sections are included below. For me, they are sufficient to raise questions about the validity of the results given by EPA and HGL in their draft report. Should these conclusions prove true, I suggest that an detailed independent review of the data analysis be undertaken, with possible use of another software program for spot-checking some of the more difficult peak separations. While it is possible that software errors might explain the observed biases for the detected nuclides, one can only speculate what might be the significance for the non-detects with unknown spectral interference.			production of the study data. GammaVision allows the user to select any of four basic "analytical engines", each of which is designed for a very different purpose. For example, the NPP-32 analysis engine is designed to allow the rapid analysis of nuclear power plant effluents, with complex spectra but well-defined peaks. The ENV-32 engine used in the SSFL background study is designed to allow the net quantification of radionuclide activities, even in the absence of well-defined gamma photopeaks. The other two analysis engines are similarly crafted for specific technical applications. After selection of the desired analysis engine, up to 40 other user-selected analytical must be specified, resulting in literally millions of possible analytical configurations used for analysis. Other analytical software packages have similar options that allow similarly divergent selections of analytical parameters, depending on the source and qualities of the spectral data. None of the possible analytical settings for any of the software packages are disclosed in Zahn's paper. The lack of disclosure as to the specific analytical parameters used by the various software packages makes the review or verification of the presented results impossible. The paper's data and conclusions are, therefore, both non-persuasive and indefensible.

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AW	7 (cont.)				While Mr. Weitzberg has separately referred to two IAEA papers in support of his concerns, both suffer from a similar lack of disclosure discussed above regarding analytical parameters, and neither indicates that GammaVision suffers from any analytical defect or should be preferentially rejected in favor of other software packages. It is noted that the SSFL background study laboratory's analytical protocols were carefully crafted by experienced technical experts in the field of environmental gamma spectrometry, and were validated both internally and externally by review of raw spectral data, recalculation of results, and successful participation in blind performance evaluation sample analyses independent of the project and its various stakeholders.
AW	8	For the many radionuclides that were found to be non-detects and were not expected to be found in the background samples, nevertheless, BTVs expressed as pCi/g were computed and placed in the summary tables. This gives the erroneous impression that these concentrations are somehow applicable to the future on-site measurements without further consideration of the source of these gamma rays and how they might relate to the specific radionuclides they are listed with. It would be informative and helpful, if a table was included in the report that separately lists these nuclides, with an explanation of their lack of physical presence.			This issue has been carefully considered. "Non-detected" radionuclides might be subject to either a positive or negative bias. In the presence of significant or measurable positive bias, the results would no longer be "non-detected". "Non-detected" radionuclides subject to a significant negative bias would show a measurable negative trend, likely in the samples and certainly in the method QC. Such results would inevitably fail the "negative activity" test performed on all results, and those results would be rejected. There is not believed to be significant adverse risk of otherwise undetected bias in the sample results.

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AW	8 (cont.)	Because these nuclides are not physically present in the background samples, any gamma ray counts in these bins do not relate to the subject nuclides and must come from other nuclides that are in the background such as Bi-214. If these bins are elevated in a site sample the counts could come for the target nuclide or more likely from the background nuclide, unless there is significant elevation in the count rate. If so, procedures must be set in place to confirm that the elevated counts are from the target nuclide and not from background nuclides. Examination of the gamma spectrum in question for other lines from the suspect nuclide or confirmation that other related nuclides are present in the correct proportions can be used to establish confidence in the presence of the target nuclide. Simple look-up tables for these nuclides cannot be used simply based on the BTVs.	NA	NA	As to the statistical treatment of data sets with small numbers of "detects" vs. data sets with large numbers of "detects", that is a matter of considerable technical debate. The reporting of this data in terms of pCi/g, though objectionable to Mr. Weitzberg, is necessary to facilitate comparability to the on-site sample results. Decisions regarding the development and use of the Look-Up Table for the on-site sample data are not finalized and will consider the various opinions on the subject. Specifically, radionuclides that are subject to a known and consistent positive bias from ubiquitous, naturally occurring radionuclides, such as the Bi-214 contribution to the Sb-125 quantification, are believed to be acceptable for their intended use. The results have been appropriately qualified, flagged as "S" to disclose the spectral interference, and the data user is cautioned against using the result as an absolute assay of the radionuclide concentration, either as an aggregate value or at any specific background location. The evaluation of the on-site data against the BTV's will address the appropriate use of the data. Background data that suffers from spectral interference but which is not similarly reliable or useable for its intended purpose has been appropriately rejected. In the data tables, the K flag data qualifier description has been modified.

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Boeing					
Being	1	Boeing appreciates the significant effort that has gone into the Radiological Background Study (RBS) and the "Statistical Methods" paper and commends EPA, HGL, Anita Singh and all others who have contributed to the study. Overall, the final report reflects the attention to detail that went into the project planning and the field work.	NA	NA	EPA appreciates this comment. No response necessary.
Boeing	2	The use of full terms (e.g., Distance test locations) and acronyms/abbreviations (e.g., DTL) is mixed throughout the document and can be confusing. Suggest defining them the first time they are used in each section and then just use the acronyms/abbreviations thereafter.	NA	NA	Full terms were included more frequently in the text to assist nontechnical stakeholders with their understanding of the document.
Boeing	3	If risk-based standards are included for comparison to background, then the suburban resident land use scenario should also be included.	NA	NA	EPA disagrees with this comment. The Administrative Order on Consent (AOC) states that the development of risk assessments will not be required and the use of suburban residential land use scenarios are not discussed in the AOC.
Boeing	4	An objective of the study is to minimize both false positives and false negatives when applying BTVs for onsite data comparisons. Since there are cases when the background study BTV is less than the measured maximum in the background dataset, false positive errors will occur when compared to onsite data (i.e., contamination will be identified when it is really background). In the case when the BTV is less than the maximum value, we suggest that EPA and risk managers consider either revision of the BTV to the maximum measured value, or inclusion of an additional step that allows consideration of the maximum detected value for cleanup decisions.	NA	NA	As stated in the report, EPA attempted to maintain a proper balance between the potential of false positives and false negatives when comparing results to onsite data. EPA believes that the use of the 95% upper simultaneous limit (USL95) strikes this balance. Final Clean-Up Values will be submitted by the California Department of Toxic Substances Control (DTSC) for stakeholder review and comment. A request that allows consideration of the maximum detected value for cleanup decisions can be made to the DTSC during the Look-Up Table review and comment period.

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Boeing	5	Boeing believes that prior comments by Tom Rucker ("Comments on SSFL Radionuclide Background Data Sets and their Statistical Treatment" 6/20/2011), Abe Weitzberg and others are still pertinent. These included, a. Possible false detects for many radioisotopes including, Nb-94, Cs-134, Sb-125, Eu-155, Ho-166m, Na-22 and Te-125m, are based on misidentification due to interference with gamma peaks from naturally occurring radionuclides. Since EPA radiochemists acknowledge these results are not real, and detection limits vary between laboratories, the use of the same library for on-site measurements will not eliminate the possibility of similar false detects for these radioisotopes during the Area IV sampling program. b. Rational for eliminating many of the U-238 and Th-232 daughter products from the AOC look-up table (EPA concurs with this position in Section 9.5). c. Including both Cs-137 and its daughter Ba-137m in the look-up table should be avoided. EPA specifies a BTV for Cs-137+D (Cs-137 plus Ba-137m) in Table 8.4 and a separate BTV for Ba-137m in Table 8.2. d. Problem with applying the Kaplan-Meier	NA	NA	a. It has been acknowledged that the radionuclides listed have shown an unanticipated high bias due to the presence of very low-abundance, isoenergetic gamma emissions from ubiquitous naturally occurring radionuclides. The generally absolute bias (as opposed to a relative bias) has been made apparent in the background study through the lab's analysis of very large sample sizes over long counting periods. Though relatively small, the bias is believed to be consistent, predictable, and repeatable when the same analytical library is used for subsequent analyses. Reanalysis of the background study samples has been determined to be impractical and unreliable, under the current circumstances. Maintaining the existing library settings, thereby ropagating the equivalent bias into the on-site sample analyses, allows for the accurate and reliable quantification of net sample activity, relative to the background study results. While this may seem counter-intuitive, it is believed to be a reliable measure of the impact of site operations on the radionuclides of interest. The on-site sample laboratory results alone should not be used as an

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Boeing	5 (cont.)	process to uncensored data (see comments on Appendix B below, relating to application of the Kaplan-Meier process to uncensored data). e. Lack of any background data for sediments, drainage channels and evaporative concentration areas			indication of on-site radionuclide concentrations, but the comparison to the BTV, etc. provides an accurate trigger for elevated net activities. It should be carefully noted that this analytical bias is not believed to be "misidentification" per se, in which one measurement is misclassified as another. In the case of the background study data it is believed that the presence of analyte A is properly identified as analyte A, if present, with consideration that the result is biased high. It is acknowledged that, in the initial laboratory results, analyte A may be reported in positive quantities, even when it is not present in the sample. The net result, however, is accurately assessed during the comparison of the on-site sample results to the BTVs. In the data tables, the K flag data qualifier description has been modified. b. It is not proposed that all progeny radionuclides from a given decay chain should be omitted from consideration in the AOC Look-Up Table. In long decay chains, specific short-lived progeny can only persist over reasonable periods of time when their production is continually supported by the decay of the long-lived parent radionuclide. In these cases, the concentration of the progeny is

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Boeing	5 (cont.)				equivalent to (or at least a function of) the concentration of the parent. Also, in these cases, the PRG of the short-lived progeny are much higher, generally by orders of magnitude, than that of the short-lived parent. In all such cases, including all cases where the progeny radionuclide has been removed from consideration, any increase in progeny activity sufficient to cause an excursion and to require responsive action will inarguably be accompanied by levels of parent activity far in excess of those which would require responsive action anyway. The assessment of the short-lived progeny is, therefore, considered redundant. It is important to note that the removal from consideration of certain decay-chain radionuclides does not apply to those with a sufficiently long half-life to allow them to possibly be present in actionable quantities if they are unsupported by the parent radionuclide. c. Ba-137m may be removed from future consideration, as it is only present as a supported progeny of Cs-137 and the PRGs for Ba-137m are much higher than those for Cs-137. However, the omission of any radionuclides from the Look-Up Table will be discussed with stakeholders during the DTSC-sponsored meetings.

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Boeing	5 (cont.)				d. This comment has been addressed below in the Appendix B section. Additional text has been included in Appendix B, Section 4. e. EPA is currently evaluating onsite sample results to determine if sediments, drainage channels, and evaporative concentration areas have any effect on the activity of radionuclides. These results will be available for stakeholder comment when the study is complete.
Boeing	6	Suggest description of the geology in Area IV at SSFL include additional detail. While 80% of Area IV is underlain by the Chatsworth Formation, the western end and northern edge of Area IV, especially the drainages to the north, are within or receive drainage from the Santa Susana Formation.	2.2	2-1, pp6	EPA agrees with this comment. Some additional detail was added to the description of the geology in Area IV at the SSFL.
Boeing	7	Suggest that the text describing the RBRAs (Chatsworth and Santa Susana formations) acknowledge that there is some uncertainty in the native concentrations of naturally-occurring radionuclides since geological formations also have variable sub-formation strata (shale, versus siltstone, versus conglomerate), and the concentrations may vary between them.	2.4	2-4, pp4	EPA agrees with this comment. It has been noted in the text (first paragraph of Section 2.3), that there is some uncertainty in the native concentrations of naturally-occurring radionuclides because geological formations also have variable sub-formation strata.

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Boeing	8	For completeness, the descriptions of the DTLs should include the underlying geologic formations.	2.5	2-5, 2-6	Soil sampling at the DTLs only included surface soil samples that could likely be found in atmospheric releases from the SSFL. Therefore, underlying geologic formations were not considered in determining the location of the DTLs. Stakeholders provided considerable input into the parklands and open space that were ultimately considered for DTL locations.
Boeing	9	Since some locations were modified during field work, suggest documentation of change in a table that gives the sample number and the reason for the location movement. This text should identify how many samples in each of the three RBRAs were moved from the original randomly located position.	3.1	3-1, pp6	EPA agrees with this comment. Any sample location movement due to onsite conditions is discussed in the fifth paragraph of Section 3.1. All field sample location movements were discussed and approved by all stakeholders present.
Boeing	10	Clarify the criteria for a gamma measurement being classified as an anomaly.	3.2	3-2, pp1	An anomaly is defined as an area with an increased gamma radiation count rate as determined by the professional judgment of the surveyor. In general, if the surveyor observed measurements that did not appear consistent throughout the DTL or RBRA then the location would be deemed anomalous. Section 3.2 has been modified. In addition, Section 3.2 has been modified to include a deviation from the Sampling and Analysis Plan regarding the use of a collimated detector.

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Boeing	11	It is unclear how surface samples were collected, so additional description should be added to the text. Were these discrete samples, collected at <6" below ground surface, and/or multiple sleeves collected and composited across an area? Please describe how the surface sample collection differed from the subsurface composite sample collection.	3.3	3-2	Surface soil samples were collected as discrete samples across an area large enough (approximately 1-ft in diameter) to meet the laboratory's analysis requirements and the project's archiving requirements. The report has not been modified.
Boeing	12	Subsurface samples should be clearly defined, based on the sampling methodology, as 'composite' samples collected over the entire subsurface sampling interval.	3.4	3-3	Subsurface samples were collected over the entire depth interval and composited into one homogeneous soil sample per location. The report has not been modified.
Boeing	13	Sampling equipment decontamination is generally followed by some type of quality control sampling (i.e., equipment rinsate blanks) to confirm the quality of the decontamination process. The report should describe whether these types of quality control samples were collected.	4.2.4	4-2	EPA agrees with this comment. Information on the collection of equipment rinsate blanks has been added to Section 4.2.4.
Boeing	14	The gamma anomaly detected at TP-16 needs further description, including 1) whether TP-16 is a DTL or RBRA location and 2) how the +/-30% readings was selected as the criterion for an anomaly. Table 5.1 suggests that the TP-16 anomaly is not either a high or low reading but a range which is larger than the other DTLs. The highest value is still consistent with the gamma measurements for other DTLs in this quadrant. The rationale for elimination of TP-16 should be further described.	5.0	5-1, pp3 and Table 5.1	TP-16 was a DTL. Section 5.0 has been updated. A +/- 30% count rate change was not selected as the criteria for anomaly. The count rate at the southern boundary of the DTL was approximately 10,000 counts per minute (cpm) and increased consistently to approximately 33, 000 cpm at the northern boundary. The surveyor's professional judgment was the consistent trend of increasing count rate indicated an anomaly. Section 5.0 has been updated with further explanation. Table 5.1 does not require any changes.

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Boeing	15	Suggest that the description of "additional uncertainty" include potential sources, magnitude (in comparison to both expected uncertainties and detection limits) and consequences (in terms of data evaluation). In addition, the third paragraph in this section seems to limit the data use of the data to developing an overall range of background radionuclide concentrations and not to determining location-specific background. Suggest further discussion/explanation of this as it is important to understand the ways in which the data should and should not be used.	6.2.1	6-3	The first paragraph of Section 6.2.1 has been modified to describe "additional uncertainty" more fully. The third and fourth paragraphs of Section 6.21 have been modified to include further discussion of the usability of the data.
Boeing	16	The acceptable difference between primary and duplicate samples has been increased by 10% to account for under-estimated variability in background concentrations. The discussion is based on sigma (σ) and Z-values. It would be helpful to also include the percentage range of acceptable differences in the text since this is also a common measure of duplicate samples. It seems that the discussion has increased the range from +/- 20% (2σ or Z=1.96) to +/- 30% (3σ or Z=2.58), however this is not clear in the text.	6.2.3	Pg 6-4	The use of a 10% additional uncertainty factor in field duplicate samples does not readily translate into an increased range, because those factors are summed in quadrature (i.e. square root of the sum of squares) with other uncertainty factors, which will vary considerably from samples with little or no activity to samples with significant, measurable activity. There has been no change to the text.

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Boeing	17	The univariate outlier tests available in Scout 2008 Version 1.00.01 includes Dixon's Test and Rosner's Test, which were used to identify outliers as indicated in Appendix A. Both Dixon's Test and Rosner's Test assume the data are normally distributed. Were the data checked for normality prior to applying these outlier tests? Were there datasets that are not normally distributed? Are there applicable outlier tests for data that were not normally distributed? Suggest additional text description to clarify this process.	Section 7.2, Appendix A, Appendix B	NA	Additional text with an example has been added in Appendix B using modern robust statistical and graphical methods that are used to identify multiple outliers in all data sets – normal or non-normal. Dixon and Rosner Tests: It should be noted that the presence of moderate to extreme outliers lying outside of the tails (e.g., 3-5 sigma) of a normal distribution destroys the normality of a data set. Therefore, one may not use the Dixon and Rosner test to identify moderate to extreme outliers (lying outside the tails of a normal distribution), which are inevitable in environmental applications. Dixon (1953) and Rosner (1975) tests were developed when computing power that we have today was not available. The use of modern computer intensive robust methods and graphical displays is recommended to properly identify outliers present in an environmental data set. As with all other tests used in this report, Dixon and Rosner test results are also supplemented by graphical displays (e.g., Q-Q plots). The use of Q-Q plots to assess data distributions and to identify outliers is quite common in statistical literature (Gnanadesikan [1977], Hoaglin, Mosteller, and Tukey [1983], Singh and

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Boeing	17 (cont.)				Nocerino [1995], Johnson and Wichern [2002]). Unlike classical methods (e.g., Dixon and Rosner tests), graphical methods do not suffer from masking effects. Moreover, Scout software equipped with robust outlier identification methods was also used to verify the proper identification of outliers. However, due to complexity of those methods, results obtained using robust methods were not included in this report.
Boeing	18	The level of detail describing each of the DTL comparisons is not the same for each radionuclide. Suggest that presentation regarding the levels of significance of the tests be presented.	7.3	Page 7-1 to 7-3	Additional details regarding the DTL comparisons for each of the five radionuclides listed in Section 7.3 can be found in Appendix A.

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Boeing	19	Suggest additional text to describe rationale for outlier exclusion given the amount of EPA's research for RBRA selection and the conclusion from the DTL study samples that the RBRAs were not affected by SSFL operations. Given the solid foundation for the background sample locations and the DTL conclusion, please carefully consider exclusion of any data from the dataset and provide rationale as to why the data were excluded, As described in EPA's 2006 document entitled: Data Quality Assessment: Statistical Methods for Practitioners, EPA QA/G-9S. EPA/240/B-06/003), statistical test identification of outliers is not recommended. The EPA document states the following: *"One should never discard an outlier based solely on a statistical test. Instead, the decision to discard an outlier should be based on some scientific or quality assurance basis. Discarding an outlier from a data set should be done with extreme caution, particularly for environmental data sets, which often contain legitimate extreme values. If an outlier is discarded from the data set, all statistical analysis of the data should be applied to both the full and truncated data set so that the effect of discarding observations may be assessed. If scientific reasoning does not explain the outlier, it should not be discarded from the data set."* If exclusion is solely based on statistical test results, these 'outlier' data may likely be part of the background. See comments on pp. B-2 below. Suggest each identified outlier be listed in a table and rationale provided for exclusion, and consideration of these outliers be included in cleanup planning.	8.0	NA	Most of the data sets collected from the various strata are fairly consistent with low variability. Not many outliers were identified in the various RBRA data sets (considering the amount of data that were evaluated). However, concentrations of several radionuclides collected from the 3 RBRAs are significantly different (e.g., Ra 228). For each radionuclide, the objective was to establish a defensible background data set represented by a "single" population free of outliers potentially representing impacted observations. There was some concern among the stakeholders that some of the chosen RBRA locations might have been impacted by the site activities. When data from the various strata could not be merged, separate BTV estimates were computed for each stratum. The use of USL95 already addresses the issue of increased number of false positives. To control the number of false negatives, it is recommended not to include moderate to extreme outliers in the computation of USL95. USL95 should be computed based upon a data set representing the main dominant population; it is not desirable to accommodate a few outliers in the computation of USL95 resulting in inflated USL95. Modern statistical methods dealing with data sets consisting of non-detects, computer intensive robust outlier identification methods, and graphical displays addressing complex statistical issues associated with large environmental data sets

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Boeing	19 (cont.)				(e.g., SSFL data set) are missing from the earlier environmental literature (e. g., Gilbert, 1987, Guidance documents). Some of the earlier recommendations were made based upon text book type data sets. In the present study, data sets evaluated represent real data sets requiring the use of modern statistical method which are not described in the environmental literature cited in this comment.
Boeing	20	There are a few instances where the USL95 is lower than the maximum in the dataset, which may lead to increased Type I error rates if applied for onsite data comparisons. Suggest EPA consider other statistical parameters, including the maximum detection, for the BTV or adding a second comparison step (see General Comment 4).	8.1	Pg 8-1 to 8-3	As stated in the report, EPA attempted to maintain a proper balance between the potential of false positives and false negatives when comparing results to onsite data. EPA believes that the use of the USL95 strikes this balance. Final Clean-Up Values will be submitted by DTSC for stakeholder review and comment. A request that allows consideration of the maximum detected value for cleanup decisions can be made to the DTSC during the Look-Up Table review and comment period.
Boeing	21	See General Comment 4 regarding false positives. Suggest including a discussion regarding how the selected uncensored ND values compare to the detected concentrations and how the selection of the maximum uncensored ND will affect the objective of minimizing false positives when the BTV is used for onsite comparisons. Also, see comments for Appendix B below regarding use of uncensored non-detect data.	8.2.1	8-3 to 8-4	Also see the detailed response to Appendix B comments below regarding non-detect data. It should be noted that to maintain proper balance between false positives and false negatives, the use of USL95 was proposed to estimate BTVs. The use of negative values as real concentration values increases data variability; therefore decision

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Boeing	21 (cont.)				statistics (e.g., USL95, UTL95-95) computed using such data sets with negative values will be inflated, potentially resulting in a higher number of false negatives. Nondetects (especially negative values) should be considered properly in the computation of USL95 and other statistics including data variability.
Boeing	22	Boeing in general agrees with EPA's suggestions to utilize combined BTVs ("management decisions") in an effort to simplify comparison to onsite data and remedial decisions, and since the RBRAs were identified as un-impacted background locations. Further, use of a combined BTV would reflect actual site soil conditions. For example, much of the soil at SSFL has been excavated and mixed either during initial construction, operations, or during demolition. Therefore, for comparison to onsite concentrations, surface and subsurface background datasets would need to be combined in order to have an appropriate and representative BTV. It is also the case that locations at SSFL have mixed Chatsworth and Santa Susana formation soils and therefore the selection of a BTV that includes only one of these formations may increase the number of false positives when the BTVs are used onsite.	9.1 thru 9.5	NA	Comment noted.
Boeing	23	Since PRGs are risk-based goals "incremental or in addition to background", it could be argued that the Lookup Table value should always be BTV + PRG. Depending on the relative sizes of the PRG and BTV, this summation would default to a Lookup Table value of PRG (if PRG >>> BTV) or BTV (if BTV >>> PRG).	9.1	NA	Final Clean-Up Values will be submitted by DTSC for stakeholder review and comment. This request can be made to the DTSC during the Look-Up Table review and comment period.

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Boeing	24	The selection of the highest uncensored ND as the BTV increases the probability of false positives when these values are used onsite since seven of the radionuclides were detected above the highest uncensored ND. While many of these reported detections and highest uncensored NDs appear within reasonable analytical variability, two radionuclides have reported detections approximately an order of magnitude (10-times) higher than the highest uncensored ND. The report concludes that these reported detects are not real, but they could occur onsite. See General Comment 4. Suggest BTVs for these two radionuclides be re-evaluated, and carefully considered for how they may be used for cleanup planning since they were detected in the background dataset.	Table 8-1	NA	EPA believes that any detection in a dataset consisting mostly of NDs must be evaluated with caution. However, a request that allows consideration of the maximum detected value for cleanup decisions can be made to the DTSC during the Look-Up Table review and comment period.
Boeing	25	It appears the distribution test results were not summarized in the outputs in Appendix A for each step in which the distribution test was performed. It would be clear what tests were used if the normality test results were provided for each step.	Appendix A	NA	When dealing with radionuclide data sets from two or more populations, it is hard to justify normality assumption for all populations. Non-parametric distribution free tests were used when comparing two or more populations. Nonparametric tests do not require a normality test and a normality assumption. As discussed in Appendix B, there is no substitute for graphical representation of the data. All test results (e.g., GOF test, outlier test, WMW and Gehan tests, and ANOVA test) are supplemented with graphical displays including: normal Q-Q plot, boxplots, and multiple Q-Q plots.

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Boeing	25 (cont.)				For each radionuclide, BTV estimates are computed based upon the "established" background data set represented by a single population. Computation of BTV estimates depends upon data distribution. In addition to graphical displays exhibiting BTV estimates (e.g., USL, UTL, UPL), BTV estimates are also summarized in the various tables. *Those tables specifically state the data distribution.* BTV estimates are computed accordingly using parametric or nonparametric estimation methods as summarized in Appendix B. For data set consisting of nondetects, the nonparametric KM method was used to compute various BTV estimates.
Boeing	26	The statistical comparisons between RBRAs are sometimes conducted between only the two Chatsworth RBRAs, and sometimes between all three RBRAs. Was the choice based on a visual inspection of the box plots? Please clarify this in the Appendix B text.	Appendix A	NA	If concentrations of two formations are comparable, the two RBRAs of Chatsworth formations are compared. If concentrations of the two formations are not comparable, then all 3 RBRAs are compared. All statistical comparisons are supplemented by graphical displays. Graphical displays provide added information about the level of discrepancies between the concentrations of two or more populations which is not easy to understand and appreciate simply by looking at test statistics (e.g., WMW, Gehan and K-W test statistics). Whenever possible, data from the various strata were merged together to compute BTV estimates.

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Boeing	27	"However, the Project Team and the stakeholders decided to use univariate methods as described in this appendix." – A summary of the rationale/benefits of using univariate statistics instead of multivariate statistics would be beneficial, and, perhaps, an example provided.	Appendix B	Pg B-1, pp3	EPA agrees with this comment. Appendix B has been updated accordingly.
Boeing	28	Please see Section 8.0 comment above regarding outlier analysis and exclusion. Suggest table of outliers be included and rationale provided. Also, as stated on page 2 of Appendix A (regarding Cs-134 statistical analysis), some statistical analysis was performed using outliers as well as the truncated dataset. Please clarify where calculated statistical results with and without outliers are published.	Appendix B	Pg B-2, pp1 and Pg B-3, pp5	For Cs-134, a non-detect negative value = -0.041 represents an outlier. A careful review of Appendix A (regarding Cs-134) reveals that Figure 6 has BTV estimates using all NDs (therefore including the outlier, -0.041) and Figure 7 exhibits the various BTV estimates without the NDs (therefore without the outlier, -0.041).
Boeing	29	The text in this bullet is unclear, please clarify.	Appendix B	Pg B-4, 3rd main bullet, 2nd sub-bullet	The text referenced in this comment states that if the data collected from all three RBRAs were to determined to be different, the next step in the process was to determine if the data collected from the two Chatsworth Formation RBRAs (Lang Ranch and Rocky Peak) were the same or different.
Boeing	30	Statistical tests and examples of when the tests can be used are described. However, the tests are not listed in the order of when and what statistical tests should be conducted. It would be helpful if a flow chart was provided that describes the rationale for which statistical tests are used, and when and why they are used.	Appendix B, Section 2.0	NA	Additional text is added in this section. Appendix B was voluntarily provided to help the readers understand methods used and results summarized in Appendix A.

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Boeing	31	For data that are normally distributed, the data for the three RBRAs were compared using a one-way ANOVA. Was the 2-way ANOVA considered to account for potential interactions between RBRAs and surface/subsurface soil?	Appendix B, Section 2.0	NA	Two-way ANOVA was not used.
Boeing	32	The discussion of the USL95 states that this statistic is expected to be above all measured background observations. However, for some of the radionuclides presented in Section 6 of the main report (Tables 8-3 to 8-7) there are measured observations that fall above the USL95. This seems like a contradiction with the statement above. See General Comment 4 for consideration of false positives if these BTVs are used for comparison to onsite data.	Appendix B	B-10	Also see response to comment 4 above. In layman's terminology, a USL95 provides coverage to all observations (current and future) coming from a "single" population (background population here) with probability 0.95. Depending upon the data variability, some observations (current and future) will exceed USL95 with probability 0.05. Observations not coming from the same background population will exceed the USL95. Additionally, it should be noted that USL95 has a built-in outlier test, therefore observations exceeding USL95 may be considered as not belonging to the same background population. The computation of USL95 depends upon the sample size, data mean and variability, and the critical value of the test statistic (Mahalanobis Distance [MD]) used. Sample values (e.g., maximum value) exceeding USL95 potentially represent extreme values and may not be considered as coming from the same background population.

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Boeing	32 (cont.)				When using parametric methods, observations such as the maximum value exceeding USL95 should not be used as estimates of BTVs. Such estimates ignore most of the information (e.g., data distribution, variability, percentiles) contained in the data set. This kind of biased use of data defeats the purpose of collecting extensive background data sets. The use of USL95 on "established" background data sets is meant to provide balance between false positives and false negatives.
Boeing	33	The paper states *"Some technical stakeholders believe that radionuclide data consisting of NDs (positive as well as negative results) should be treated as detected data. They suggest that one should ignore the ND status of radionuclide concentrations and their detection limits/MDCs. All detected as well as ND values should be treated equally in the computation of various statistics of interest including BTV estimates. They do not acknowledge the fact that in practice concentrations cannot be negative."* *(Red text emphasis added)* Boeing believes this statement is incorrect as explained below: **1. Censored vs. Non-censored Data**	Appendix B, Section 4.0	Page B-17	The use of negative values as real concentration values increases the data variability. Computation of BTV statistics (e.g., USL95, UTL95-95) based upon such data sets will be inflated, potentiall y resulting in an increased number of false negatives. Nondetects (especially negative values) should be considered properly in the computation of decision statistics. It is well known that in practice concentrations cannot be negative. Negative concentrations represent background noise and/or instrument background. It should be noted that for data sets consisting of non-detects, it is hard to justify distributional assumptions. This may be one of the reasons that the earlier environmental literature (cited in this comment 33) recommend to report all values, even negative values, as detects. Those suggestions were made without thorough investigation of the proposed use of negative values on the computation of various decision

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Boeing	33 (cont.)	In the measurement of chemicals and in most of the literature on statistical treatment of "no-detects", ND refers to a semi-quantitative value such as <5. <5 means the chemical laboratory cannot quantify the measurement other than to say it lies somewhere between 0 and 5 where 5 is a reporting limit. This data point is said to be censored or left-censored, meaning we have no knowledge of the "true" value to the "left" of 5. Indeed, one of the key references used by the paper and the source of the Kaplan-Meier (K-M) Method, is "Nondetects and Data Analysis – Statistics for Censored Environmental Data" by Dennis R. Helsel (underline added). Note the use of the term "censored" in the title, implying that these methods are to be used for data sets including <MDC data, but not for uncensored data. In contrast, radionuclide data is reported as quantitative numbers, that may be detects (above the MDC), positive non-detects (below the MDC) or even negative numbers (also less than then MDC). Therefore, a radionuclide ND is a quantitative number, e.g. 3, and is not reported as <5 even though the MDC may be 5. Measured, reported radionuclide results are therefore un-censored or non-censored, even if they are NDs or less than the MDC. The K-M method is used for treating chemical data sets that include some left-censored ND data such as <1, 5, <2, 6, 7, <3 using the methods discussed in the paper on pages B-14 through B-16. It should not be used to treat radionuclide data that includes some un-censored ND data less than the MDC of 5 (e.g., results such as 1, 5, 2, 6, 7, 3). All radionuclide data is based on measurement and is reported as uncensored data.			statistics including UTL95-95 and USL95. Additionally, until recently (e.g., Helsel, 2005; Singh, Maichle, and Lee, 2006; and ProUCL software) rigorous statistical methods to deal with data sets consisting of non-detects with multiple detection limits were not available to environmental scientists. At present, to the best of our knowledge, the non-parametric KM method is the most appropriate method (Singh, Maichle, and Lee, 2006) to compute various statistics of interest based upon data sets consisting of non-detects (censored or uncensored), especially negative non-detects. Some examples illustrating the issues associated with the use of negative values as true detected concentrations are discussed in Section 4.0 of Appendix B.

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Boeing	33 (cont.)	As such, it should be treated statistically as uncensored data and included directly, as is, in the BTV calculations, and not censored. The classic statistical reference "Statistical Methods for Environmental Pollution Monitoring" by R. O. Gilbert (and also referenced in the paper), states on page 178, *"... reporting of actual concentrations is the best procedure from both practical and statistical analysis points of view ... It is strongly recommended here that, whenever the measurement technique permits, report the actual measurement, whatever it may be, even if it is negative."* **2. Negative Concentrations?** The paper states *that "They [stakeholders] do not acknowledge the fact that in practice concentrations cannot be negative."* Although it is true that one cannot have a negative concentration, a negative value reported by the laboratory does have value and meaning. This is because a laboratory does not directly measure concentrations. It measures the number of radioactive particles detected during a fixed count period from a sample that exceeds the instrument background. The net count rate can be negative under certain conditions. This net count rate is then used to calculate a concentration using sample mass, count time, detection efficiencies, geometric factors, unit conversions etc.			

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Boeing	33 (cont.)	All radionuclide analysis involves counting a number of radioactive decays (either gammas, alphas or betas) emitted by the sample per unit time within a low-background laboratory counter. Even though counters are shielded to minimize any extraneous radiation entering from the outside or from within the equipment itself, there will always be a low level of radioactive particles detected even with no sample present. This is known as the instrument background, which is measured by counting a non-radioactive blank. For example, if the instrument background is measured at 10 counts per minute (cpm). The MDC expressed in cpm will be $2 \times 1.645 \times (2 \times 10)^{1/2} = 14.7$ cpm. If a sample that is not radioactive is counted 10 separate times, we would measure 10 cpm each time. However, since we are counting background plus the sample (gross count), and since instrument background is variable and will fluctuate during each of the counting periods, we may measure the following gross counts. 10, 11, 12, 9, 9, 10, 7, 13, 11, 8 Subtracting the single instrument background count of 10 cpm and ranking, we get the following net counts. -3, -2, -1, -1, 0, 0, 1, 1, 2, 3 Note that some are negative net counts, and all are less than the MDC of 14.7 cpm, therefore all are considered non-censored NDs. The simplest parametric statistic for			

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Boeing	33 (cont.)	this data set is the arithmetic mean which is calculated to be 0 cpm, which correctly confirms the prior statement that the sample is non-radioactive. However, if we were to dismiss the negative net counts as meaningless, the mean of the reduced data set of 0, 0, 1, 1, 2, 3 would be 1 cpm, which would incorrectly imply the sample exceeded background. Likewise if we were to censor the data set and report all the data as <MDC, the data set would be <14.7, <14.7, <14.7, <14.7, <14.7, <14.7, <14.7, <14.7, <14.7, <14.7 By excluding negative measurements, valuable information is lost and parametric or non-parametric statistics calculated based on this censored data set do not give the correct conclusions. Typically the instrument background count is established once per batch of multiple samples. The instrument background count is therefore measured at a different earlier time than the subsequent batch of samples, which themselves are counted consecutively at different times. Thus, the contribution of instrument background to the gross count for each sample can and does vary between each sample in a batch. In this way, negative net counts and subsequently negative "concentrations" sometimes occur. In summary, dismissing negative radiochemical data is not recommended.			

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Boeing	34	The paper states *"It is not clear whether USL95 and UTL95-95 represent non-detects or detects."* USL95 and UTL95-96 are calculated test statistics - not measured data points. Therefore it is inappropriate to refer to them as detects or non-detects. They simply represent calculated upper level estimates of sets of uncensored measured data.	Appendix B, Section 4.0	Pages B-21 and B-22	This issue has been considered in detail in Section 4.0 of Appendix B. A horizontal line has been displayed at the maximum nondetect value in all graphical interval plots associated with radionuclides consisting of nondetects (e.g., Figure 5, Appendix for Actinium 227). In addition to the maximum nondetect, these interval plots also exhibit all detected and non-detected concentrations, 95% percentile, UTL95-95, and USL95. These graphs can be used as additional background information if onsite observations exceed the BTV estimates. At present, to the best of our knowledge, decision statistics including USL95, UTL95, and UCL95 computed using nondetects as nondetects represent the most defensible statistics. By treating negative non-detects (background noise, instrument signal) as detects, one is simply inflating data variability.

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Boeing	35	**Prevalence of Outliers**. Of the 53 radionuclides for which background threshold values (BTVs) could be calculated (i.e., their data sets included 5 or more detects), outliers were removed from the data sets for 11 (21%) of these radionuclides. **Prevalence of 95% Upper Simultaneous Limit (USL95) Less Than Maximum Detected Value.** • Of the 19 radionuclides where **only one BTV was calculated** (because there were no significant differences between radiological background reference areas [RBRAs] or surface vs. sub-surface soil), the USL95 was < max detected value (*after* outliers were removed) for 17 (**89%**) of the radionuclides that fell in this category (Table 8-3). For most of the radionuclides with USL95 < max detected value, their data sets contained very few detected values (<15% detections). The low variability in these data sets, and the manner in which non-detect values was addressed, probably account for the USL95s < max detected values. • Of the 7 radionuclides for which **surface and subsurface BTVs were calculated** (because there were significant differences between surface vs. subsurface soils), the USL95 was < max detected value for 5 (**71%**) of the radionuclides that fell in this category (Table 8-4). The combined BTVs were also < max detected value for 5 of the 7 radionuclides. Again, most of the radionuclides having USL95 < max detected value were associated with low detection frequencies.	NA	NA	1. Most of the data sets collected from the various strata are fairly consistent with low variability. Considering the amount of data that were processed, not many outliers were identified in the various RBRA data sets. However, concentrations of several radionuclides collected from the 3 RBRAs are significantly different (e.g., Ra 228). For each radionuclide, before computing BTV estimates, the objective was to establish a defensible background data set represented by a "single" population free of outliers potentially representing locations impacted by site activities. 2. When data from various strata could not be merged, separate BTV estimates were computed for each stratum. Obviously, when data from the 3 RBRAs are not comparable, the data variability of the combined data set will be higher than variability of the RBRAs considered individually. Higher variability will result in a higher USL95, sometimes greater than the maximum value and some times smaller than the maximum value. 3. A data set consisting of a higher number of non-detects should yield a lower USL95 by accommodating the non-detect status of the non-detected values.

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Boeing	35 (cont.)	• Of the 10 radionuclides for which **Chartsworth Formation and Santa Susana Formation BTVs were calculated** (because there were significant differences between these two formations), one or more of the USL95s was < max detected value for 7 (**70%**) of the radionuclides that fell in this category (Table 8-5). However, for the combined BTVs, the USL95s were equal to or > max detected values for all but one of the radionuclides that fell in this category. • Of the 14 radionuclides for which **BTVs were calculated for individual RBRAs** (because there were significant differences between RBRAs), one or more of the USL95s was < max detected value for all (**100%**) of the radionuclides that fell in this category (Table 8-6). For the combined BTVs, however, the USL95s were equal to or > max detected values for all of the radionuclides that fell in this category. • Of the 3 radionuclides for which **BTVs were calculated for individual data sets** (because there were significant differences between individual data sets), the USL95 was < max detected value for most of the individual data sets (Table 8-7). However, combined BTVs were equal to max detected values for all 3 of these radionuclides.			4. If BTVs are to be estimated based upon data sets (purpose of collecting the RBRA datasets) incorporating data variability, it is suggested to use USL95 as computed based upon the collected data set without using the biased and judgmental approaches.

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Boeing	35 (cont.)	**Conclusions Based on the Above** 1. The number of radionuclides for which 'outliers' were removed is significant, and our comments on the RBS Report questioning the appropriateness of this practice are highly relevant. 2. There is a tendency for radionuclides with a significant number of uncensored non-detect values to have USL95s < max detected values. This may be attributable, in part, to the manner in which EPA is treating uncensored non-detect values (i.e., use of the Kaplan-Meier Method). 3. The USL95s for *individual* strata are often < max detected value. Boeing recommends that BTVs be based on the *higher* of the USL95 or max detected value. 4. The USL95s for *combined* strata are typically equal to or > the max detected value. Boeing recommends use of the combined BTVs for all radionuclides.			
ACME					
ACME	1	ACME does concur with the document, although there should be a few additions to help the general public with understanding this document. With the amount of acronyms found in this document, it would be helpful to put the definition of each at the bottom of each page to make it easier to understand the 238 pages rather than flipping back to the glossary at each page.	NA	NA	Full terms were already included more frequently in the text than usual to assist nontechnical stakeholders with their understanding of the document. EPA will be happy to assist the general public in their understanding of this document.
Cleanuprocketdyne.org					
Cleanup	1	I support the use of USL95 as the statistical tool to base background threshold values upon.	NA	NA	No response required.

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Cleanup	2	I remain concerned about the effort to remove radionuclides from the lookup table list, due to the lack of detections within the background locations. My concern is because it is still likely that these radionuclides will be detected on the site based on historical use, as detailed in the HSA Technical memorandums. If the radionuclide is not detected in many samples within the background dataset, this potentially means that it is not readily found in background, whether primordial or not, this says it is not expected based on global fallout and nuclear weapons testing. To me, this means that if it isn't found in the background dataset, but it IS found on the site, then the likely cause of the findings on the site, are site related. If we then do not have a background threshold value to compare findings at the site with, then a nondetect value will be needed. It seems that we do not know enough yet to make removal decisions, and that should be driven by the onsite data. My concern about this, is related to the notion that removing radionuclides from the list will make it easier for "soils to pass" I think there is a slight misconception out there (perhaps it is mine), but the onsite analysis is already driven by the suites decided upon based on historical operations, technical meetings discussing historical findings and the subsequent sampling plans already approved and being implemented. "what to look for" was decided in the sampling plan. Once that sampling has begun (and it is well underway) it is now a question of what you find. Removing a radionuclide from analysis is certainly short-sighted, and if you do find it, then you need a comparison number. For this reason, I do not understand the push toward removal of radionuclides from the list. Please clarify if I have misunderstood the process.	NA	NA	Comment noted. ~~EPA does not state that they are supporting the effort to remove radionuclides from the Look-Up Table, but rather that this may be an action taken during the development of the Final Look-Up Table.~~No radionuclides have been removed from the SSFL Radiological Background Study Report. All analytical data has been presented. In order to simplify the onsite screening process, certain radionuclides may be omitted from the Final Look-Up Table. ~~As stated in the report,~~ The omission of any radionuclides from the Look-Up Ttable will be discussed with stakeholders during the DTSC-sponsored meetings.

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Cleanup	3	There is also some concern about removing statistical outliers from the dataset, and given the purpose is to represent a range of what true background is likely to be, I believe that removal of outliers at this level, done strictly on a statistical basis, could potentially bias the range downward since some of those higher detects might be "true of background" in that fallout and concentrations over time might have a cumulative effect in areas that are not readily apparent today, despite the efforts made by all to identify undisturbed land. I was involved in identifying over 200 points that were scrutinized for consideration as background reference areas, and can confirm that lively discussion and debate occurred in examining each and every location chosen. In looking at the work identified by the aerial photography experts, it was amazing what was identified that was not visible to the human eye when ground-truthing, as we all did as a group to these areas. For this reason, it is conceivable that despite the effort made, some accumulation effects of the area might account for higher results that now might be deemed as outliers, when indeed they are part of "true background" being the natural range of occurance that will exist. However, because the treatment of nondetects has a counter effect, I believe this concern is dealt with. If needed, I think it would be worth the exercise of going through a few of the representative radionuclide box-plots to discuss and see how the range changes based on the inclusion of those outliers. Perhaps a simple with and without slide on 4 or 5 radionuclides with significant outliers and we can see how they turn out. This might be helpful in determining if this is a real issue or not, and also provide comfort through dialogue so that the stakeholders can have a clearer understanding of this issue.	NA	NA	For some radionuclides, comparisons between datasets with and without outliers have been included in Appendix A.

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Cleanup	4	I appreciate the exercise taken in comparing to distance test locations when this concern arose through the limitation of how far out we could go, because of the limitation of where the santa susana and chatsworth formation(s) were located and how far from the site they extended. I appreciate EPAs willingness to take this extra step to confirm that the reference areas were indeed within a reasonable distance so as not to be directly affected by the field laboratory operations. Please note though that this was a very limited sampling and comparison and can in no way be used to confirm or deny the presence of contaminants related to the site at distances greater than or lesser than the RBRAs. These broad conclusions made by stakeholders should be cautioned with limited statistical representation of the surrounding areas that specifically looked for unimpacted areas, not areas that were specifically within a drainage pathway. For this reason, this data cannot and should not be used for such broad conclusions.	NA	NA	Comment noted.
Cleanup	5	I agree with the necessity to have both formations represented because of the mix of soils that likely occurred between the borrow pit area in the santa susana formation, which was used to backfill in many areas of the site. I think where statistically possible to combine datasets for the purposes of better statistical strength, but that these differences in approach must be carefully documented since the "product" will be the lookup tables which will have to stand the test of time.	NA	NA	Comment noted.

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Cleanup	6	I support the Inter-Method Comparison of results which identifies those radionuclides where this additional comparison is needed because of the analytical limitations to some radionuclides, and based on the discussions about this issue at the technical meetings, believe EPA has put a lot of attention to detail on this and I particularly appreciate the quality expertise that EPA has provided on this, and the willingness to go into detail on a lay-person level so that stakeholders such as myself can truly participate in a meaningful way.	6.2.4	Pgs 6-4 thru 6-6	Comment noted.
Cleanup	7	I support this issue and believe it should be expanded due to the political nature of this project and how statements tend to be spun into something new and different at politically charged workgroup and other meetings, and hope that the "intended use" can be expanded upon.	6.2.6	Pg 6-7	Comment noted.
Cleanup	8	I request that I be listed in the references for section 2.3 of the report specifically related to area and location selection which I was deeply involved as "boots on the ground" based on much of my GPS work provided to EPA at the beginning of the project.	2.3	Pgs 2-2 thru 2-4	EPA deeply appreciates your contribution to this project, specifically in relation to your assistance with determining the background study sampling locations. Your name has been added to the text in Section 2.3.
Cleanup	9	I support the use of USL95 and appreciate the detail given as to the differences between these different statistical approaches.	8.0	NA	Comment noted.
Cleanup	10	I support the single value in cases where statistically similar, but feel that this may also inadvertently complicate the applicability as to where these lines are finally drawn and more importantly, why.	8.2.2.1	Pg 8-5	Comment noted.

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Cleanup	11	Use of the maximum nondetect value as the BTV in the case where few than five detections has occurred and do not support removal from the list as others have suggested because of the need for a comparison value.	8.2.2	Pg 8-5	Comment noted. No radionuclides have been removed from the SSFL Radiological Background Study Report. All analytical data has been presented. In order to simplify the onsite screening process, certain radionuclides may be omitted from the Final Look-Up Table. The omission of any radionuclides from the Look-Up Table will be discussed with stakeholders during the DTSC-sponsored meetings.~~Comment noted. EPA does not state that they are supporting the effort to remove radionuclides from the Look-Up Table, but rather that this may be an action taken during the development of the Final Look-Up Table. As stated in the report, the omission of any radionuclides from the Look-Up table will be discussed with stakeholders during the DTSC-sponsored meetings.~~
Cleanup	12	I support EPAs willingness to lay this out for us all, as a roadmap on process forward when these scenarios occur (which are the basis for most of the disagreement and posturing that we have seen over the last (fill in the blank) number of years. I also appreciate EPAs recommendations and believe we should start there, but hear from each of the stakeholders within this format, as to how these issues should otherwise be handled. It is my opinion that this will allow for some of the politics to shake away, and leave the positions that can be supported by fact and scientific basis to stand firm.	NA	NA	Comment noted.
Cleanup	13	Use of the PRG when they are higher than BTV - I support	9.1	Pg 9-1	Comment noted.
Cleanup	14	Use of the highest BTV when separate values were calculated for surface and subsurface soils - I support	9.2	Pgs 9-1 thru 9-2	Comment noted.

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Cleanup	15	Use of combined background threshold values when separate values were calculated for each geologic formation - This is an interesting issue considering the absolute need to differentiate these in the beginning. I believe the issue is that we can know what the formation is for the RBRAs but for the site, we really cannot know when it is disturbed soils (which by definition, all soil movement will be of disturbed soils). Since there has been a mix throughout the site through the construction process, it really cannot be known which value to compare to, and to choose the highest or lowest would produce false positives and false negatives. The only solution that is fair is to combine the two and since the site is limited to the two, and so will be the BTV results.	9.3	Pg 9-2	Comment noted.
Cleanup	16	Same as above	9.4	Pg 9-2	Comment noted.
Cleanup	17	Potential removal of radionuclides from the list. I do NOT support this. Instead, I believe the list needs to be driven by the onsite analysis and not removal based on its presence or lack thereof in background. If it is present at the site, it must be on the lookup table.	9.5	Pg 9-2	Comment noted. No radionuclides have been removed from the SSFL Radiological Background Study Report. All analytical data has been presented. In order to simplify the onsite screening process, certain radionuclides may be omitted from the Final Look-Up Table. The omission of any radionuclides from the Look-Up Table will be discussed with stakeholders during the DTSC-sponsored meetings.
Cleanup	18	I appreciate the "Management decisions" section 9 of the report, and truly believe that the key to finally establishing fair look-up table values will be in these management decisions, and appreciate the extra meeting to discuss these issue on the 28th.	NA	NA	Comment noted.